

Evaporation of Hot-Jupiters: Observations and Models

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Among the more than one hundred extra-solar planets known, over 15 orbit closer than 0.1 AU from their parent star. We will present the observations and models of the evaporation of these “Hot-Jupiters”. The observations started with the discovery made with HST that the planet orbiting HD 209458 has an extended atmosphere of escaping hydrogen. More recent observations obtained with HST confirm the escape of the gas. And, even more, they show the presence of oxygen and carbon at very high altitude in the upper atmosphere. This shows that the escape mechanism is not a pure Jeans’ escape, but an hydrodynamical blow-off of the atmosphere. To interpret these observations, we developed a comprehensive model to investigate the leading mechanisms and to evaluate the escape rate. The high temperature of the upper atmosphere heated by the far and extreme UV, combined with the tidal forces, allows a very efficient evaporation of the upper atmosphere. The results of this model nicely fit the observational estimates of the escape rate from HD 209458b. Moreover, this gives a new explanation for the very low number of planets inside 0.04 AU, the distance below which we could predict the presence of a new kind of planet made from the remaining core of evaporated giant planets which would have migrated inside this limit.

